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09/876,742	06/07/2001	Toshiyuki Miyauchi	450100-03274	1867

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FROMMER LAWRENCE & HAUG
745 FIFTH AVENUE- 10TH FL.
NEW YORK, NY 10151

EXAMINER	
TORRES, JOSEPH D	

ART UNIT	PAPER NUMBER
2133	5

DATE MAILED: 10/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/876,742	Applicant(s) MIYAUCHI ET AL.	
	Examiner Joseph D. Torres	Art Unit 2133	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 June 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-48* is/are rejected.

7)☒ Claim(s) *1-48* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 June 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Specification

Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

1. The abstract of the disclosure is objected to because 1) the abstract exceeds 150 words and 2) the abstract uses references to the drawings. Correction is required. See MPEP § 608.01(b).

Claim Objections

2. Claims 1-48 are objected to because of the following informalities: claim 1 recites, "A decoder adapted to...". Since "adapted to" only suggests or makes optional, the term "adapted to" fails to further limit the claim. The Examiner suggests: A decoder for....

Claims 2-24 depend from claim 1, hence inherit the deficiencies of claim 1.

Claim 25 cites similar language as in claim 1.

Claims 26-48 depend from claim 25, hence inherit the deficiencies of claim 25.

Appropriate correction is required.

3. Claim 3 recites, "the data corresponding the second maximum likelihood path" in lines 4. The Examiner suggests the following to correct grammatical problems: the data corresponding **to** the second maximum likelihood path.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-48 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "the probability" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim 1 recites the limitation "the value received" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim.

Claims 2-24 depend from claim 1, hence inherit the deficiencies of claim 1.

Claim 25 cites similar language as in claim 1.

Claims 26-48 depend from claim 25, hence inherit the deficiencies of claim 25.

5. Claim 2 recites the limitation "the likelihoods" in line 2. There is insufficient antecedent basis for this limitation in the claim. Note: it is not clear whether "the likelihoods" refers to "the maximum likelihood path", "the log likelihoods" or some other likelihood.

Claim 26 cites similar language as in claim 2.

6. Claim 3 recites the limitation "the data corresponding to the maximum likelihood path" in line 3. There is insufficient antecedent basis for this limitation in the claim.

Claim 3 recites the limitation "the data corresponding the second maximum likelihood path" in line 4. There is insufficient antecedent basis for this limitation in the claim.

Claim 27 cites similar language as in claim 3.

7. Claim 8 recites the limitation "the bits" in line 2. There is insufficient antecedent basis for this limitation in the claim. Note: use of "the bits" gives the impression that the bits in claim 8 are the same bits as in claim 7. The Examiner recommends deleting "the".

Claims 11, 32 and 35 cite similar language as in claim 8.

8. Claim 39 recites the limitation "the coding starting state" in line 7. There is insufficient antecedent basis for this limitation in the claim.

Claim 39 recites the limitation "the coding terminating state" in line 10. There is insufficient antecedent basis for this limitation in the claim.

9. Claim 20 recites the limitation "the multiplications for computing the probability by logarithmic additions" in lines 2 and 3. There is insufficient antecedent basis for this limitation in the claim.

Claim 20 recites the limitation "the additions for computing the probability by logarithmic maximum value computations" in lines 3 and 4. There is insufficient antecedent basis for this limitation in the claim.

Claims 22, 44 and 46 cite similar language as in claim 20.

The Examiner would like to point out that claims 1-48 of the current application are replete with 35 U.S.C. 112, second paragraph problems. The claims should be thoroughly revised so as to remove all 35 U.S.C. 112 problems.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. Claims 1-3, 14, 25-27 and 38 are rejected under 35 U.S.C. 102(e) as being anticipated by Van Stralen, Nick Andrew et al. (US 6304996 B1, hereafter referred to as Van Stralen).

35 U.S.C. 102(e) rejection of claims 1 and 25.

Van Stralen teaches a decoder (and a method for using the decoder) for determining a log likelihood logarithmically expressing the probability of passing an arbitrary state on the basis of the value received as soft-input (Figure 8A in Van Stralen is a log likelihood calculator for updating alpha and beta recursions logarithmically expressing the probability of passing an arbitrary state on the basis of a value received as soft-input; also see col. 2, lines 39-41, Van Stralen) encoded so as to provide at least three or more paths for getting to each state and decoding by using the log likelihood (Figure 3 in Van Stralen teaches alpha and beta metrics representing likelihoods for at least three or more paths for getting to each state and decoding by using the log likelihood), said decoder comprising: a path selection means for obtaining at least two or more paths showing a high likelihood out of the at least three or more paths for getting to each state and selecting the maximum likelihood path from the obtained at least two or more paths (Switches 54 and 56 in Figure 4A in Van Stralen are alpha path selection means for obtaining at least two or more alpha paths showing a high likelihood out of the at least three or more alpha paths for getting to each state and selecting the maximum likelihood alpha path from the obtained at least two or more alpha paths; Switches 54 and 56 in Figure 4B in Van Stralen are beta path selection means for obtaining at least

two or more beta paths showing a high likelihood out of the at least three or more beta paths for getting to each state and selecting the maximum likelihood beta path from the obtained at least two or more beta path: Note: the alpha and beta recursion update circuits of Figure 4A and 4B are replicated various times for use in Figure 3 in Van Stralen: Note also, the Abstract in Van Stralen teaches that the decoder in the Van Stralen patent are for implementing a standard maximum a posterior, MAP, algorithm).

35 U.S.C. 102(e) rejection of claims 2 and 26.

Comparator 78 in Figure 5C of Van Stralen is comparison means for comparing the likelihoods of all the combinations of two paths selected from all the three or more than three paths getting to each state (Note: Figure 5C is a block diagram of the Log Addition circuits 67 in Figure 5A of Van Stralen). Also see col. 9, lines 10-22 of Van Stralen for details.

35 U.S.C. 102(e) rejection of claims 3 and 27.

Absolute Value circuit 106 in Figure 8A in Van Stralen is an absolute value selection means for selecting the absolute value of the difference between the data corresponding to the maximum likelihood path and the data corresponding the second maximum likelihood path.

35 U.S.C. 102(e) rejection of claims 14 and 38.

The log-MAP algorithm taught in Van Stralen is based on the natural logarithm (see Abstract of Van Stralen).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 4, 5, 15-24, 28, 29 and 39-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Stralen, Nick Andrew et al. (US 6304996 B1, hereafter referred to as Van Stralen) in view of Benedetto et al. (S. Benedetto, D. Divsalar, G. Montorsi, and F. Pollara, Soft-Output Decoding Algorithms in Iterative Decoding of Turbo Codes, TDA Progress Report 42-124, NASA Code 315-91-20-20-53).

35 U.S.C. 103(a) rejection of claims 4 and 28.

Van Stralen, substantially teaches the claimed invention described in claims 1-3, 14, 25-27 and 38 (as rejected above). In addition, Absolute Value circuit 106 in Figure 8A in Van Stralen is an absolute value selection means having an absolute value computing means for computing the absolute value of the difference of each of all the combinations of two paths selected from all the three or more than three paths getting to each state. Comparator 78 in Figure 5C of Van Stralen is a means for comparing the magnitude of the computed values

However Van Stralen, does not explicitly teach the specific use of **the computed absolute values being compared for magnitude** on the basis of the information on the outcome of comparison obtained by comparing the likelihood of each of all the combinations of two paths selected from all the three or more than three paths getting to each state by means of said path selection means.

Benedetto et al. (hereafter referred to as Benedetto), in an analogous art, teach that both Approximation Algorithms 1 and 2 require comparison steps for the absolute value (Page 86 of Benedetto; Note in Approximation 1, the absolute value, x, is compared to 0 and b/a and in Approximation 2, the absolute value, x, is compared to η). One of ordinary skill in the art at the time the invention was made would have been highly motivated to employ the approximation methods in the Benedetto paper to simplify the calculation to the log likelihood term required by the MAP algorithm.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Van Stralen with the teachings of Benedetto by including use of the computed absolute values being compared for magnitude. This modification

would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of the computed absolute values being compared for magnitude would provide the opportunity to simplify the calculation of the log likelihood term required by the MAP algorithm.

35 U.S.C. 103(a) rejection of claims 5 and 29.

Note: Approximation Algorithm 1 in Benedetto is a linear approximation means computing by linear approximation a correction term added to obtain said log likelihood and expressed by a one-dimensional function relative to a variable and the variable, x, is the absolute value of the difference between the data corresponding to said maximum likelihood path and fed from said absolute value selection means and the data corresponding to said second maximum likelihood path (Page 86 of Benedetto).

35 U.S.C. 103(a) rejection of claims 15, 16, 39 and 40.

Benedetto teaches a first probability computing means for computing for each received value a first log likelihood logarithmically expressing a first probability determined by the code output pattern and said received value (log-BCJR 1 Decoder in Figure 6 on page 79 of Benedetto is a first probability computing means for computing for each received value a first log likelihood logarithmically expressing a first probability determined by the code output pattern and said received value); a second probability computing means for computing for each received value a second log likelihood logarithmically expressing a second probability of getting to each state from the coding starting state in the time

series (log-BCJR 2 Decoder in Figure 6 on page 79 of Benedetto is a second probability computing means for computing for each received value a second log likelihood logarithmically expressing a second probability of getting to each state from the coding starting state in the time series); a third probability computing means for computing for each received value a third log likelihood logarithmically expressing a third probability of getting to each state from the coding terminating state in the inverted time series (log-BCJR 3 Decoder in Figure 6 on page 79 of Benedetto is a third probability computing means for computing for each received value a third log likelihood logarithmically expressing a third probability of getting to each state from the coding terminating state in the inverted time series); and said second probability computing means and said third probability computing means having path selection means (see Approximation 1 on page 86 of Benedetto and selection circuits in Figures A-1 and A-2 in Benedetto).

35 U.S.C. 103(a) rejection of claims 17 and 41.

The log-BCJR MAP algorithm is based on the natural logarithm (see Approximation 1 on page 86 of Benedetto).

35 U.S.C. 103(a) rejection of claims 18 and 42.

Note: the Absolute Value circuit 106 in Figure 8A in Van Stralen is an absolute value selection means for selecting the absolute value of the difference between the data corresponding to the maximum likelihood path and the data corresponding the second maximum likelihood path replicated in each of the Update Alpha/Beta Recursion circuits

of Figure 3 in Van Stralen; hence Van Stralen teaches said second probability computing means and said third probability computing means have absolute value selection means for determining the absolute value of the difference between the data corresponding to the maximum likelihood path and the data corresponding to the second maximum likelihood path showing the second highest likelihood, respectively.

35 U.S.C. 103(a) rejection of claims 19 and 43.

Note: Approximation Algorithm 1 in Benedetto is a linear approximation means computing by linear approximation a correction term added to obtain said log likelihood and expressed by a one-dimensional function relative to a variable and the variable, x, is the absolute value of the difference between the data corresponding to said maximum likelihood path and fed from said absolute value selection means and the data corresponding to said second maximum likelihood path (Page 86 of Benedetto).

35 U.S.C. 103(a) rejection of claims 20, 22, 44 and 46.

The equation, -ax+b, on page 86 of Benedetto is a computation means for replacing the multiplications for computing the probability by logarithmic additions and the additions for computing the probability by logarithmic maximum value computations and computations of said function.

35 U.S.C. 103(a) rejection of claims 21, 23, 45 and 47.

The maximum a posteriori probability decoding operation in Benedetto is conducted on the basis of the Log-BCJR algorithm (see Approximation 1 on page 86 of Benedetto).

35 U.S.C. 103(a) rejection of claims 24 and 48.

Figure 1 on page 64 of Benedetto teaches convolutional codes.

12. Claims 6, 9, 10, 12, 13, 30, 33, 34, 36 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Stralen, Nick Andrew et al. (US 6304996 B1, hereafter referred to as Van Stralen) and Benedetto et al. (S. Benedetto, D. Divsalar, G. Montorsi, and F. Pollara, Soft-Output Decoding Algorithms in Iterative Decoding of Turbo Codes, TDA Progress Report 42-124, NASA Code 315-91-20-20-53) in view of XP-000888685 ("Simplified Log-Map Algorithm", Research Disclosure, Kenneth Mason Publications, Hampshire, GB, No. 421, May 1999, Page 612, ISSN: 0374-4353: Note this publication was provided by the Applicant in US Application 09/875310).

35 U.S.C. 103(a) rejection of claims 6 and 30.

Van Stralen and Benedetto et al. (hereafter referred to as Benedetto), substantially teaches the claimed invention described in claims 1-5,14-29 and 38-48 (as rejected above). In addition, Benedetto teaches a decoder for determining the log likelihood logarithmically expressing the probability of passing a given state on the basis of the received value regarded as soft-input and decoding the input by using the log likelihood (the Abstract, Appendix and Figures 6, A-1 and A-2 in Benedetto teach a decoder for

determining the log likelihood logarithmically expressing the probability of passing a given state on the basis of the received value regarded as soft-input and decoding the input by using the log likelihood), said decoder comprising: a linear approximation means for calculating a correction term to be added to the log likelihood (Approximation 1 on page 86 of Benedetto teaches a linear approximation means, -ax+b, for calculating a correction term to be added to the log likelihood), the correction term being expressed in a one-dimensional function relative to a variable (in Approximation 1 on page 86 of Benedetto, -ax+b is a one-dimensional function relative to the variable x); and said linear approximation means being adapted to compute said correction term using a coefficient representing the gradient of said function for multiplying said variable (see Approximation 1 on page 86 of Benedetto; Note: a represents the one-dimensional gradient of the function, -ax+b).

However Van Stralen and Benedetto, do not explicitly teach the specific use of the coefficient being expressed as a power exponent of 2.

Document XP-000888685, in an analogous art, teaches that $B = 4 = 2^2$, hence a in Benedetto $=2^{-2}$ since a in Benedetto = 1/B. Document XP-000888685 provides explicit motivation for combining stating that "...B = 4 achieves performance that is very close to exact implementation".

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Van Stralen and Benedetto with the teachings of Document XP-000888685 by including use of the coefficient being expressed as a power exponent of 2. This modification would have been obvious to one of ordinary skill

in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of the coefficient being expressed as a power exponent of 2 would have provided the opportunity to achieve performance that is very close to exact implementation (see the last paragraph of the first page of Document XP-000888685).

35 U.S.C. 103(a) rejection of claims 9, 10, 33 and 34.

Selection of a particular value for b in the equation, -ax+b, is a particular embodiment of the equation, hence does not deviate from the scope or intent of the teachings in the Benedetto paper.

35 U.S.C. 103(a) rejection of claims 12 and 36.

$|x-y|$ in the equation $A - (|x-y|/B)$ of Document XP-000888685 is a positive value, hence Document XP-000888685 teaches said correction term shows a positive value. Note also, this is consistent with the Benedetto paper since the Benedetto paper requires $x > 0$.

35 U.S.C. 103(a) rejection of claims 13 and 37.

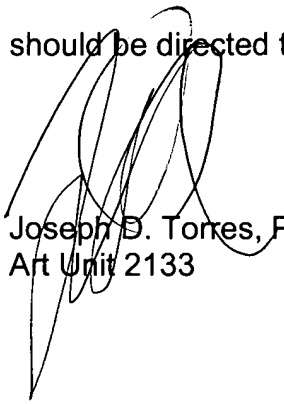
Document XP-000888685 teaches $(A - (|x-y|/B))_+ = A - (|x-y|/B)$ when $A - (|x-y|/B) > 0$ and $(A - (|x-y|/B))_+ = 0$ when $A - (|x-y|/B) \leq 0$.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Viterbi, Andrew J. et al. (US 5933462 A) teaches a log of the likelihood ratio using the forward and backward state metrics and the branch metrics for a selected state. Acampora, Anthony (US 4087787 A) teaches decoders which implement an approximation of the Viterbi algorithm by using analog processing techniques. Benedetto et al. (S. Benedetto, D. Divsalar, G. Montorsi, and F. Pollara, A Soft-Input Soft-Output Maximum A Posteriori (MAP) Module to Decode Parallel and Serial Concatenated Codes, TDA Progress Report 42-127, NASA Code 315-91-20-20-53). Liew et al. (Liew, T.H.; Yeap, B.L.; Woodard, J.; Hanzo, L.; Modified MAP algorithm for extended turbo BCH codes and turbo equalizers; First International Conference on 3G Mobile Communication Technologies (IEE Conf. Publ. No. 471), 27-29 March 2000; Page(s): 185 –189). Wang et al. (Yan Wang; Chi-Ying Tsui; Cheng, R.S.K.; A reduced complexity implementation of the Log-Map algorithm for turbo-codes decoding; Proceedings. 2000 IEEE International Conference on Acoustics, Speech, and Signal Processing; Volume: 5, 5-9 June 2000, Page(s): 2621 –2624).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph D. Torres whose telephone number is (703) 308-7066. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert Decady can be reached on (703) 305-9595. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-746-7240.



Joseph D. Torres, PhD
Art Unit 2133